

MINING-EXPERIMENT AND MINE-SAFETY STATIONS.

MAY 20, 1914.—Committed to the Committee of the Whole House on the state of the Union and ordered to be printed.

Mr. FOSTER, from the Committee on Mines and Mining, submitted the following

REPORT.

[To accompany H. R. 15869.]

The Committee on Mines and Mining, having under consideration H. R. 15869, reports the same to the House with the recommendation that the bill be passed.

The pending bill has a double purpose: (1) To establish 10 mining experiment stations in important metal-mining regions in public-land States and 1 in Alaska, with a view to the advancement of the mining industry in those regions, and (2) to establish in the larger developed mining regions of the country 15 movable mine-safety stations for rescue cars, with a view to advancing more rapidly and in a more satisfactory manner the mine-safety education and mine-rescue work under the Bureau of Mines.

The bill now pending is expected to replace recent House bills Nos. 97, 113, 169, 1644, 1646, 1879, 4641, 8898, 9662, 9837, 11098, 11101, 15606, and 15869 of the Sixty-third Congress, looking to the establishment of individual experiment stations in nearly all public-land States, and House bills Nos. 14691, 15221, 15223, and 16195, looking to the establishment of individual mine-rescue cars or stations. Under its provisions will also be included the reconstruction and operation of eight existing mine-rescue cars now being operated under the Bureau of Mines.

This legislation has been prepared with considerable care. It is not based upon the plans or wishes of any one person or organization, but it has been drawn up as a result of a series of conferences among the miners, mine operators, mine surgeons, and engineers from different parts of the country, careful consideration having been given to the needs of the industry and of the country along the lines indicated.

The committee has heard only commendation from the miners and operators for the work of the Bureau of Mines as far as that work

has gone, but criticism is general and emphatic concerning the slowness of the progress in that work due to lack of adequate facilities. The situation is well expressed by the following extract in a letter from John Mitchell to the chairman of the committee:

As one of the advocates of the establishment of the Bureau of Mines, I have watched with interest the good beginning it has made; but I have noted with regret the inadequacy of its facilities for taking up even the matter of coal-mine accidents in a manner commensurate with the urgency and importance of that subject; also the omission from its work of investigations looking to safety and health conditions in the metal mines and investigations looking to the general upbuilding of the industry.

In a movement of this kind the inadequacy of the facilities tends to bring discredit on the work, and thereby to discourage both those associated with it and those for whose benefit the movement was inaugurated. I fear it also indicates a failure to comprehend the importance and magnitude of the undertaking and the difficulties involved.

CONDITIONS SHOWING THE NEED FOR THIS LEGISLATION.

(1) That the mining industry of the country, and especially the metal-mining industries in our public-land States, are not keeping pace with the normal development of the country is clearly shown by the following data:

In the population of the public-land States west of the Mississippi and Missouri Rivers there was an increase from 14,800,000 in 1900 to 19,600,000 in 1910, an increase of 32 per cent.

The agricultural crops of the public-land States had a valuation in 1900 of \$921,000,000, and a valuation in 1910 of \$1,950,000,000, an increase of 112 per cent.

During similar periods the average annual valuation of all the mineral products in the public-land States increased from \$287,000,000 during the period 1901 to 1905 to an average annual valuation of \$358,000,000 during the period from 1906 to 1910, an increase of a little less than 25 per cent; whereas the production of the precious metals in the public-land States decreased from an annual average valuation of \$136,000,000 during the earlier period (1901-1905) to an average annual valuation of \$127,000,000 during the latter period (1906-1910), a decrease of nearly 7 per cent.

No better illustration could be given of the contrast in the treatment of these two great national industries than the fact that in spite of this lagging behind of the mining industry during this 10-year period, the National Government expended for the reclamation of agricultural lands in these public-land States not only all of the moneys received from the sale of public lands for agricultural purposes, but also nearly \$7,000,000 received from the sale of mineral lands.

The reduction in the number of men employed in the different metal-mining industries in the public-land States tells even more clearly than do the figures of production the falling behind of the mining industry. Unfortunately, the figures for the number of the men employed are not available for a majority of the public-land States.

Taking a single one of these States as an example, attention may be called to the fact that the average number of men employed in the metal mining and metallurgical industries in the State of Colorado for the four-year period 1900 to 1903, inclusive, was 36,189; during the period from 1904 to 1907 this annual loss was reduced to 34,364; and

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during the four-year period from 1908 to 1911, inclusive, the number of employees was further reduced to 22,560.

(2) Among the causes of this lagging behind of mine development are the following: (a) The exhaustion now under way of the more easily discovered and richer ore deposits and the fact that other rich ore deposits are not now being discovered to such an extent as to replace those now being worked as they become exhausted; (b) the absence of known methods through the use of which many existing low-grade ore deposits can be profitably worked; (c) the wasteful methods now followed in many of the mining and metallurgical operations, which, while in many cases they still bring temporary profits to mine operators, are reducing the national wealth in a manner which can be remedied only by the discovery and use of more efficient methods of treatment.

(3) Of a number of our important mineral resources we have for both the present and future needs of the country but one inadequate supply. The utilization of certain of these important resources, as in the case of coal, oil, and natural gas, destroys them. Common prudence demands that through the necessary researches the Nation should learn how to use this one supply of its mineral resources more wisely and more efficiently or with less waste or loss than is now the case.

(4) The loss of life in the different branches of the mining industry is a discredit to the Nation. It calls for more extended inquiries and researches on the part of the Federal Government and a proper dissemination of the results obtained; it calls for more stringent police supervision or inspection by the States, and for more determined cooperative effort on the part of both the miners and mine owners in the way of making and enforcing safety regulations.

The National Government should do its full duty in this matter without further delay.

MINING, LIKE AGRICULTURE, WILL BE BENEFITED BY THE LARGER CONTRIBUTIONS FROM THE FEDERAL GOVERNMENT.

Congress is now appropriating as an aid to agricultural advancement nearly \$28,000,000 per annum. These funds are being expended and the work authorized is being carried forward through a well-organized department with a cabinet head and with nearly 14,000 employees.

That these large expenditures have resulted in still larger benefits to the country there can be no doubt; and one of the evidences of benefits is to be seen in the large increases in the aggregate value of the farm products of the country, which had an estimated value of less than \$5,000,000,000, in the year 1898, and nearly \$9,000,000,000 in the year 1912.

The conditions underlying agricultural progress differ as to many details from those associated with mining, but the broad general principles of progress are the same; and the favorable response to the national aid for agriculture is itself an evidence of the result which can be depended upon if similar aid is extended to mining. Furthermore, the less extended actual experience growing out of the more limited expenditures through the Geological Survey and the Bureau of Mines on behalf of the mining industry furnishes specific evidence

of the larger benefits which may be expected to result from larger expenditures in similar directions. Thus, under the Bureau of Mines, through a small expenditure, the saving in national wealth through stopping the waste of natural gas in a single season has aggregated more than \$10,000,000, which is several times the total cost of the maintenance of the Bureau of Mines from its beginning.

The benefits which may be expected from more liberal aid to the mining industry will come (1) through the lessening of the unnecessary waste in the mining and treatment of the various mineral products; (2) through increased efficiency in mining operations by the improvement of health and safety conditions; (3) through the development of more efficient and cheaper methods in the treatment of low-grade ore deposits, which are either not now worked at all or are worked only in their richer parts or pockets. These benefits may come about either through the discovery of new methods in connection with the researches by the bureau itself, or through its activity in stimulating researches by private parties.

THE COUNTRY'S RELATION TO ITS TWO GREAT FOUNDATION INDUSTRIES.

A brief statement of facts will indicate in a general way what the National Government is doing to aid development of each of its two great basic industries, and what in turn these two industries are contributing yearly to our national wealth and progress. While the figures are not fully comparable in all respects, they will be found to be essentially correct.

AGRICULTURE AND MINING, THE NATION'S TWO GREAT FOUNDATION INDUSTRIES—WHAT THEY ARE DOING FOR THE NATION AND WHAT THE NATIONAL GOVERNMENT IS DOING FOR EACH OF THESE INDUSTRIES.

What these industries do for the nation:

	Agriculture, including forestry.	Mining and mineral industries. ¹
Number of employees.....	13,000,000	2,300,000
Yearly value of products.....	\$10,500,000,000	\$4,600,000,000
What each worker in these industries contributes to the national wealth, yearly.....	\$800	\$2,000
What each industry contributes to the freight tonnage of the country, yearly.....per cent..	22	60

What the National Government is doing for each of these industries :

Yearly appropriations.	Agriculture.	Mining.
For education:		
From direct appropriation.....	\$2,500,000	Nothing.
From land grants.....	1,030,000
From Smith-Lever Act for demonstration educational work.....	² 480,000
For 52 experiment stations, one in each State and Territory.....	1,550,000	Nothing.
For general researches and other work to aid agriculture and mining....	22,410,000	³ \$1,967,000
Total.....	27,970,000	³ 1,967,000
Per capita contribution from the people of the United States for the advancement of these industries.....	\$0.28	\$0.02
Of this contribution the per capita expenditure for safeguarding the lives of 2,300,000 employees in the mining industry is about one-half of 1 cent per annum.....		.005

¹ The scope here includes mining, metallurgical, and other mineral industries, as does the work of the Bureau of Mines.

² \$480,000 for 1915; increasing to \$4,580,000 for 1925 and each year thereafter.

³ Of this amount less than \$500,000 is expended under the Bureau of Mines in behalf of improvement of safety and health conditions among the 2,300,000 employees in the mining industry; the remainder (about \$1,300,000) is expended for geology, topography, water powers, and other problems having to do with the commercial side of mining and other industries, under the Geological Survey; and \$125,000 is expended under the Bureau of Mines for the commercial testing of the coal and oil used by the Government.

Nothing can show the national neglect of the mining industry more clearly than does the above tabular statement, in spite of the hazards of that industry and the other conditions which should appeal to the humanitarian as well as to the commercial instincts of the people. But another fact that tells the story with equal emphasis is that during the past 10 years, in addition to the large sums paid out of the National Treasury for the benefit of agriculture and the payment toward the reclamation of agricultural lands in the Western States of all funds arising from the sale of public lands in those States, even the proceeds of the sale of the Nation's mineral resources in like manner have gone not to aid mining, but to the reclamation of additional agricultural lands.

WHY THE MINING INDUSTRY HAS RECEIVED RELATIVELY SO LITTLE NATIONAL AID.

Agriculture is much the larger of the two industries; it embraces a larger number of persons, more widely distributed, and each acting as an independent agent. Its products, supplying the country with food and clothing, bring this industry even closer to the lives of the people than is the mining industry, which supplies them with the fuel which cooks their food, heats and lights their houses (built largely of mineral products), operates and supplies a large share of the materials and all the machinery of their factories, conducts and operates largely their facilities for transportation and communication, and supplies more than 60 per cent of the total freight tonnage of the country.

But, more than the above, there must be some special reasons why the mining industry has received relatively so little aid from the National Government, and these are to be found, no doubt, in certain misapprehensions concerning the industry. Mining is usually regarded as an industry made up mainly of the operation of a few large, profitable properties, such as the old Comstock mines in Nevada, the Treadwell mine in Alaska, or the Homestake mine in South Dakota.

It is usually considered to be an industry controlled by a few parties, the owners of which large properties would gladly avail themselves of an opportunity to unload on the National Government the cost of conducting researches in which they are particularly interested. Therefore it is usually considered as an industry which should be allowed, and even required, to take care of itself. These assumptions are far from correct.

The facts of the situation are: (1) These large, profitable properties are few in number; that, so far as known, their owners have never joined in a request for Government appropriation to aid the mining industry, nor have they been given any special consideration either in the establishment or in the plans of the Bureau of Mines. They have neither asked for assistance, nor have they endeavored to unload upon the Government any investigations of their own. On the contrary, at the request of the Bureau of Mines, a number of them have expended considerable allotments of their own funds on investigations which promise to be useful not only to them, but to other less important mining developments in which they were in no way interested.

(2) While the number of large mines in this country is small, there is a large number of small mines. The records show that in the country as a whole there are about 40,000 coal mines, metal mines, and quarries and about 170,000 oil wells, operated to a smaller or larger extent in connection with the mining operations. In addition to these there is a large number of operating plants connected with the smelting and other metallurgical operations and various mineral industry operations in different parts of the country. Few seem to appreciate the importance of helping those who hold these small properties to find methods of operation by which they can be worked at a profit instead of being helplessly transferred to a few large corporations who alone may have the funds for developing the processes that will make such operations possible.

(3) The most urgent appeal for larger national aid to the mining industry comes from and on behalf of the 2,300,000 employees of the different branches of the industry, who are asking the aid of the Government in the development of safer and more healthful working conditions. This humanitarian appeal should be given precedence over calls for appropriations to advance commercial gains. It comes from employees working under hazardous conditions, and a majority of whom are unfamiliar with our language, our laws, or our institutions, who have not yet realized the good will of any government. They have been led to believe that the Government of the United States is interested in their welfare and was planning to aid in bringing about safer and healthier conditions in the mining industries of this country; but they are becoming discouraged as to the realization of such plans.

(4) Another important need to be met through these larger contributions to the aid of the mining industry is on behalf of the consumers or users of the mineral products distributed throughout every section of the country. These mineral products are coming to be more and more indispensable for use in the domestic life of the people as a basis of our manufactures, a basis of transportation facilities, and in supplying the products to be transported. Under normal conditions, as our mines become deeper and our mineral resources depleted, the per capita cost of mineral products is increasing, and one important pur-

pose of the larger investigations authorized in the pending legislation will be that of finding out how this cost may be kept down to a minimum.

The increasing per capita consumption of mineral products is illustrated by the facts as to coal. The per capita consumption of coal in 1870 was less than 1 ton; it increased to 2½ tons in 1890, and to nearly 6 tons for the year 1913.

SOME SPECIAL REASONS WHY MINING SHOULD RECEIVE LARGER NATIONAL AID.

(1) In agriculture, with ordinary care of our soils, the country may be continuously supplied with annual crops. In dealing with the mining industry the fact should be kept in mind that the country has but one supply of mineral resources; that this one supply must meet the future as well as the present needs of the Nation; and that a century's experience points clearly to the fact that our needs for the more important of these resources, such as mineral fuels, precious metals, potash and phosphate deposits, will increase much more rapidly than will our population.

(2) While certain of our mineral resources, as in the case of metals, are destroyed rather slowly in use, other essential resources, such as coal, oil, and natural gas, are consumed or destroyed beyond recovery in use.

(3) In the utilization of certain of our mineral resources, such as the natural fuels, zinc, and some other of our metals, there are large losses or wastes which are believed to be unnecessary; and it is a wise duty of the National Government that it should aid in the prevention of such wastes.

(4) And more important than all the above in their appeals for the larger aid of the Federal Government are the hazards of the mining industry; the accidents which yearly result in such large losses of life, and the bad health conditions in many mines and metallurgical plants which affect adversely the vitality of employees. None of these conditions are met with in agriculture, but they are in a peculiar way characteristic of the mining industries; and these conditions alone more than justify this additional call upon the Federal Treasury.

PROPOSED MINING EXPERIMENT STATIONS.

The bill authorizes and directs the Secretary of the Interior "to establish and maintain in the several important mining regions of the United States and the Territory of Alaska 10 mining experiment stations." It is expected that these stations will be mainly in the public-land States. The exact location and the question of their being removed from time to time from one point to another is wisely left to the discretion of the Secretary of the Interior in order that the work of the several stations may be carried on at such places and in such manner as will best facilitate the metal mining resources of the country.

There are located within the boundaries of the several public-land States large bodies of low-grade ores of different types for the efficient treatment of which there are no known methods. There are other large deposits that are being worked in accordance with methods

that are highly wasteful of valuable mineral products. On the public lands in these States there are many mineral deposits concerning the value of which little is at present known. These and other associated problems, general in character, will be investigated by the several mining experiment stations to be established in such regions; and it is believed that the results of such investigations will be not only beneficial to the industry but also to the general public.

RELATIONS OF THE WORK OF THE MINING EXPERIMENT STATIONS TO THE WORK UNDER THE GENERAL APPROPRIATIONS OF THE BUREAU OF MINES.

It has been suggested that the work authorized for the several mining experiment stations to be established under this legislation might be carried on under the general appropriations for the Bureau of Mines. If these appropriations were sufficiently ample and stable, an arrangement of the kind suggested might be possible under the existing organic act of the Bureau of Mines, in the same way that the Department of Agriculture a few years ago might have established a series of agricultural experiments in each of the several States. But Congress at that time decided—and no doubt wisely—that with a view to giving such work a more stable basis and a more ample support it was better by formal act to establish agricultural experiment stations in each of the States and Territories, for each of which an appropriation of \$30,000 per annum has been authorized.

The Committee on Mines and Mining, after a careful consideration of this question, has decided that it will be unnecessary to establish so large a number of stations for the work in mining as was done in the case of agriculture; but, nevertheless, that there should be at least 10 such stations established and maintained through an appropriation of \$25,000 for each such station, in order that the local interests of the more important metal mining regions in the public-land States might receive ample and continuous consideration.

COOPERATION OF THE STATES IN THIS WORK.

Section 2 of the pending bill authorizes the Secretary of the Interior "to accept lands, buildings, or other contributions from the several States offering to cooperate in carrying out the purposes of this act." It is considered wiser that the act should not make the cooperation of any State a condition of this appropriation, nor was such condition imposed upon the States in the making of the appropriation for agricultural experiment stations. It is practically certain, however, that in mining, as in agriculture, the interested States will cooperate and will cooperate liberally with the National Government in carrying forward this important work.

In support of the agricultural colleges in the several States the appropriations by the States themselves are now many times larger than those by the Federal Government; and in the maintenance of the agricultural experiment stations established by the National Government in each of the States and Territories the appropriations by the States and Territories for 1912 was \$1,250,000, as against an appropriation of \$1,545,000 from the National Treasury.

It is believed that under the bill as reported the Secretary of the Interior will be able to locate the 10 mining experiment stations and the headquarters of the 15 mine safety stations, or rescue cars, at such points as will best serve the needs of the industry and the country, and that in doing this he will be able to secure the liberal cooperation of the several mining States in the maintenance of these stations.

The following letter from the Secretary of the Interior throws light on several phases of this legislation, though it relates especially to the proposal for the establishment of the 10 mining experiment stations:

DEPARTMENT OF THE INTERIOR,
Washington, January 15, 1914.

Hon. M. D. FOSTER,
*Chairman Committee on Mines and Mining,
House of Representatives.*

MY DEAR DR. FOSTER: Replying to your letter of December 2, which asks for an expression of opinion concerning H. R. 1646, a bill to establish a mining experiment station in the State of Colorado, and for other purposes:

There is also before me a number of similar bills for the establishment of mining experiment stations in other Western States, some of which have already received the approval of this department.

Instead of proceeding with the consideration of the special bill now submitted (H. R. 1646), I beg to report that the general policy and purpose of these several bills, viz, the establishment of experiment stations in public-land States looking to the safer and more efficient development of the mining industry in these States meets with my hearty approval and commendation.

I would suggest, however, instead of submitting to Congress a number of separate bills for the establishment of individual stations in specified localities, the adoption of the following general policy:

That there be prepared a single bill which would authorize the establishment in the public-land States and in the Territory of Alaska, on a basis in a general way similar to that indicated in the bill under consideration, of 10 mining experiment stations, these to be located at such points in these States and in the Territory of Alaska as would best facilitate the efforts of the Government in behalf of the proper development of the resources on the public lands and the less wasteful development of the mining industry in these public-land States.

There are more than 20 public-land States and the Territory of Alaska in which the mineral resources, and especially the metalliferous resources, are sufficient to constitute an important factor in our future national development. My reason for recommending this much smaller number of mining experiment stations (10 in all), is that in the development of the mining industry we do not have to contend with the varying climatic conditions found in the many different States, and it does not, therefore, seem to me necessary to establish mining experiment stations in each of these States as has been done in the case of agricultural experiment stations. Nevertheless, we do have marked differences not only in the nature of the mineral resources, but also in the conditions under which they must be developed; and the distances between mineral districts in the western half of the United States are so great that I think this number of stations, properly distributed throughout this great region, will be necessary for the proper economic prosecution of the work.

My reason for recommending that the exact location of each of these stations be left for determination at a subsequent date by the Secretary of the Interior is that this arrangement will make possible such distribution of the stations as will not only be most suitable to the proper development of resources, but will also make each station better supplement the work of each other station in carrying out the general purposes of this legislation.

In recommending the establishment of these stations in the public-land States, without, at this time, recommending the establishment of such stations in other parts of the country, the department is perhaps influenced by the fact that in these public-land States the Government is itself greatly interested in the proper development of the mineral resources in these lands; and owing to the large area of public land in these States which is nontaxable, these States are less able financially to provide for such investigations than would otherwise be the case.

For a number of years Congress has been appropriating annually for the maintenance of experiment stations in behalf of agriculture in the several States an aggregate sum

of nearly \$1,500,000. In addition to this, in the public-land States the Federal Government has expended during the past 12 years \$77,150,180 in the reclamation work of making available additional agricultural lands; and of this sum more than \$8,000,000 has come from the proceeds of the sale of mineral lands in the public-land States.

I mention these expenditures with no feeling other than that of approval; but in passing, I may call attention to the fact that the mining industry in this country does not appear to have had a square deal in the way of public recognition and aid. And in speaking of the mining industry, we need not especially concern ourselves about the profits of the few large mining companies. There are the many thousand small mine owners and prospectors struggling with difficult problems, there are the safety and welfare of the 2,000,000 employees in the various mining and mineral industries, and there are the other great national problems of waste in these industries, all of which should have our serious concern, and should have also the benefit of extended national inquiry and scientific investigation.

It would seem, therefore, that the annual appropriation necessary for the maintenance in the public-land States and in Alaska of these ten mining experiment stations, is not only a reasonable proposition, but that it represents only a small part of what the Federal Government should do for the safer and more efficient development of the mining industries of this country.

Very truly, yours,

(Signed) FRANKLIN K. LANE.

THE NEEDED ENLARGEMENT OF THE MINE-RESCUE CAR WORK, THROUGH THE ESTABLISHMENT AND MAINTENANCE OF 15 MINE-SAFETY STATIONS.

The continuance of large mine disasters and the increase of mine fatalities during the year 1913 as compared with the preceding year have brought from the country a demand for greater effort by miners and mine owners in carrying out reform measures for a more exacting inspection and police supervision by the States, and for such a reorganization and enlargement of the facilities of the National Government as will carry forward its investigations more rapidly and result in a better safeguarding of the lives of miners and an improvement in the health conditions which prevail in many of the mining, metallurgical, and other mineral industries.

PLAN PROPOSED IS RESULT OF A SERIES OF CONFERENCES.

That this reorganization and enlargement is urgently needed is the net result of a series of conferences among representatives of the miners, mine operators, and State mine inspectors. At these conferences there was a careful consideration and discussion of the many phases of a greater mine-safety problem as related to the work of each of these agencies. It was the general opinion that the failure of the National Government to press various investigations to a conclusion was retarding the mine-safety movement.

The committee has carefully considered the situation and is of the opinion that the plan proposed in this bill for the enlargement of the equipment and operations of the Bureau of Mines is a necessary feature of any general plan to bring about more rapid progress in the prevention of mine accidents and in the improvement of health conditions in the mining and metallurgical industries. In any general movement for greater mine safety the Federal Government must bear its share. This plan does not represent the conclusion of any one person, but is rather the consensus of opinion of persons familiar with the situation, and it is believed by the committee to be urgently called for at this time.

MINE-SAFETY WORK OF THE NATIONAL GOVERNMENT AND ITS RELATION TO THAT OF THE STATES, MINE OPERATORS, AND MINERS.

The following plan of cooperation in mine-safety work in this country has been discussed at these several recent conferences and has met with general acceptance as being in accord with existing law and custom. It is believed that this plan can and should be made more effective in the immediate future through the greater activity and hearty cooperation of the interested parties. The plan is as follows:

1. That the National Government shall conduct on a larger scale the necessary general inquiries and investigations, and that it shall promptly disseminate the information obtained among the miners, mine owners, and mine inspectors, in such manner as will prove most effective in bringing about the needed reforms in preventing mine accidents and in improving health conditions.

2. That each of the several mining States shall enact the needed improvements in legislation, and shall make ample provision for the proper inspection of the mines and the proper enforcement of the mining laws and regulations within their borders.

3. That the mine owners or mine operators shall install and maintain improvements which give reasonable promise of greater safety and better health conditions, as rapidly and as completely as the practicability of such improvements may be demonstrated by inquiries and investigations which the Bureau of Mines is conducting.

4. That the miners and mine operators shall cooperate both in making and in enforcing such rules and regulations as their own experience and as the investigations and inquiries in this and other countries show will aid in carrying out the purposes mentioned, especially such as will best safeguard the lives of the men who work underground.

THE WORK OF THE NATIONAL GOVERNMENT IS FURTHEST BEHIND.

Of the work of these four agencies in behalf of mine safety, that of the Bureau of Mines is most backward. It should, however, be in the lead. The State mine inspectors, mine operators, and miners have of late, through their growing interest in the safety movement, presented to the Bureau of Mines a larger and larger number of inquiries or appeals for information upon which to base their own activities. Such information is being sought for use as a basis for improved legislation in the States, or for a more rigid inspection of mines, or as a basis for better rules and regulations to be drawn up by the miners and mine owners. Improvements along all of these lines are being delayed because of the inability of the bureau to push a variety of its investigations to completion, and thereby supply the information needed.

Therefore the claim frequently set forth of late by the miners, mine owners, and inspectors, that the entire mine-safety movement is being held back by the lagging of the bureau's investigations, is unfortunately a true and reasonable claim.

THE MINE-SAFETY WORK OF THE STATES, MINERS, AND MINE OPERATORS.

The work of the States in carrying out their part of this general program in mine safety is being carried forward in a reasonably satisfactory manner. The States are already expending in their inspection and police supervision work more than the Federal Government is expending in all of its investigations in behalf of mine safety. Thus, for example, a single State, Pennsylvania, maintains a well-organized and efficient inspection force which includes a chief and 50 district inspectors; it expends in the maintenance of this work \$213,000 per annum, paying its district inspectors an average compensation of \$3,000 each in addition to traveling expenses. All of the other coal-mining States maintain a system of inspection.

Many of the mine operators have inaugurated a system of operations in which the question of safety is considered of first importance. Something more than 170 mining companies (out of a total of some 3,000 large coal-mining companies and 12,000 smaller coal-mining companies), have individually, or through the association of two or more companies, established 76 mine rescue stations at which there have been installed some 1,200 sets of artificial breathing apparatus besides the auxiliary equipment for first aid and fire-fighting work. There are also 12 mine rescue cars now operated by individual mining companies about their own local properties. The Bureau of Mines is endeavoring to stimulate such activity by private companies.

The miners are also taking up the work of safety and are appointing safety committees for the more active promotion of the movement—especially is this true in regions which have been visited by the Government mine rescue cars.

The representatives of the States, the mine operators, and the miners are all cooperating with the Bureau of Mines in this safety work, and this cooperation should, from year to year, become more and more important a factor in the progress of the safety movement. But the movement is yet in its infancy, and has reached but a few of the 2,300,000 employees in the industry.

WORK OF THE NATIONAL GOVERNMENT FOR MINE SAFETY AND WHY IT SHOULD COOPERATE IN THIS WORK.

The question as to whether the National Government should contribute to the advancement of its basic industries was settled affirmatively long ago. Congress is now appropriating for the advancement of agriculture, the more important of the two great basic industries, nearly \$30,000,000 per annum, and its program of good work includes educational and experimental or research features and general inquiries.

More recently, and on a smaller scale, Congress has inaugurated a series of inquiries and researches looking to the advancement of the other of its two great basic industries—mining. When it is remembered that in mining we deal with serious occupational hazards and with resources of which we have but the one supply, and that this one supply is not only limited, but is consumed or destroyed in use, it will be seen that there are special reasons why the mining industry should be treated with a liberality at least equal to that applied to agriculture.

The work of the National Government for mine safety consists mainly in general inquiries and investigations applicable to the conditions in all the States and in which all States are interested. It seems reasonable that this general work should be done by the National Government for the following reasons:

1. It is unreasonable to expect any one State to bear the cost of this work which is equally useful to all of the other mining States, and in which all the people in all the other States are directly or indirectly interested.

2. If such work were done by each of the several States the result would be a serious duplication of cost and effort and with varying results. If it were done by the private mine operators there would be still greater duplication and still greater variation in the results, and both the public and the miners would be suspicious of the results obtained.

3. By whatever agency the work may be done, the consumer of coal and other mineral products, representing the citizenship of the entire country, will bear the cost.

It will therefore seem proper that this general work should be conducted by the National Government, under such conditions as will command maximum public confidence and represent minimum duplication of labor and costs.

Furthermore, it is easier for the Federal Government than for the individual States or private companies to obtain information embodying the results of similar inquiries and investigations both in the United States and in the different foreign countries where mining operations are carried on.

EXISTING MINE-RESCUE CARS AND STATIONS.

During the past few years the Bureau of Mines has been maintaining and operating, during portions of each year, six mine-rescue stations and eight mine-rescue cars, all of these being considered largely as an agency for the dissemination of information among the miners and those in charge of the management of mines, and for the training of miners in mine rescue and first aid methods. This has been primarily an educational work, though in connection with it a large amount of valuable data on mine conditions has been collected.

In order to carry forward this cooperative work in a proper manner, it will be necessary to reorganize and to enlarge the work of the mine rescue cars or movable stations to a considerable extent.

EXISTING MINE-RESCUE STATIONS.

The six stations maintained and operated by the Bureau of Mines during the last few years have been located at the following points:

Pittsburgh, Pa., occupying War Department buildings assigned temporarily for the use of the Bureau of Mines.

Knoxville, Tenn., occupying rooms in the Federal building. This station will be transferred to Jellico, Tenn., in the heart of the coal fields.

Birmingham, Ala., occupying a building erected by the Bureau of Mines on a site donated to the Government for this purpose.

Urbana, Ill., occupying rooms supplied by the State University.

McAlester, Okla., occupying temporarily a building constructed by the local miners and mine operators of the district, cooperating.

Seattle, Wash., occupying a building on the State University grounds that was erected for the Philippine exhibit at the Seattle Exposition.

Each of these stations has been in charge of a foreman miner whose special business it was to give training and instruction in mine-rescue and first-aid work to such miners as came to the station for such training. When there are no miners applying for training at the station the foreman miner in charge is authorized to visit the nearby mines and give instruction at the mines themselves, taking with him the equipment, usually one-half dozen helmet outfits and material for first-aid instruction kept at the station for training purposes. In case of a mine disaster in any of the coal fields near a station, the foreman miner takes his rescue equipment to such mines and with the aid of men trained by him in the immediate vicinity, renders such service as he can in connection with the rescue of the injured or imprisoned miners.

RELATIVE EFFECTIVENESS AND COST OF MINE-SAFETY CARS AND FIXED STATIONS.

The average yearly cost of maintaining the existing fixed mine rescue stations has been about \$3,200 per station. The average yearly cost of operating a mine rescue car under the existing inadequate system has been about \$7,000 per car.

In relative effectiveness, that is, as a means of disseminating information and awakening interest and cooperation among the miners in the mine-safety movement, the advantage is greatly in favor of the rescue car, for the reason that the work is carried on at the mines, where all the miners and mine officials can see it in progress and cooperate in the movement, and where the miners who are willing to take special rescue and first-aid training can do so without loss of time from their mining work or incurring expenses of travel and board elsewhere.

For this reason it would be well to discontinue the operation of such fixed mine-rescue stations as are not located in the center of a thickly settled mining population and have their work carried on by rescue cars or movable stations. It is, however, considered advisable to maintain certain fixed stations which are so located, such, for example, as those at Birmingham, Ala., and McAlester, Okla., and the two new stations at Jellico, Tenn., and Norton, Va. These five fixed stations, already provided with buildings, can each be operated within its restricted sphere without being considered a part of the pending legislation.

EXISTING RESCUE-CAR WORK.

The mine-rescue cars are distributed as follows:

Car No. 1, anthracite coal field, Pennsylvania, headquarters at Wilkes-Barre, Pa.

Car No. 2, Colorado-New Mexico coal fields, headquarters at Denver, Colo.

Car No. 3, Indiana-Kentucky coal fields, headquarters at Evansville, Ind.

Car No. 4, Kansas-Missouri-Oklahoma coal fields, headquarters at Pittsburg, Kans.

Car No. 5, Montana-Washington coal fields, headquarters at Billings, Mont.

Car No. 6, Wyoming-Utah coal fields, headquarters at Rock Springs, Wyo.

Car No. 7, West Virginia-Virginia-east Kentucky coal fields, headquarters at Huntington, W. Va.

Car No. 8, Lake Superior iron and copper districts, headquarters at Ironwood, Mich.

One car (No. 8) is devoted to work in the metal-mining fields.

The cars are out-of-date wooden Pullman coaches, purchased from and refitted by the Pullman Co. to meet the special needs of the Bureau of Mines work, after they had been removed from the regular service because of age and wear. In refitting these cars for the mine-rescue work of the bureau one-half of each car is arranged with small rooms containing office headquarters, certain equipment, and spaces for heating, cooking, eating, and for sleeping berths. In the other one-half of the car the lower Pullman berths have been removed and the entire space is taken up with mine rescue and first-aid equipment. The upper berths have been retained and are used as additional sleeping places for the men connected with the work, and especially for the extra men who in the absence of other accommodations may be housed on these cars in times of mine disasters.

The average cost of the seven existing cars—which have no steel underframe—including their refitting, has been about \$1,750 per car, this representing mainly the cost of refitting the cars; but the cost of repairs has been heavy, ranging from \$500 to more than \$1,000 per car per year, in order to keep them in a reasonably safe condition for travel on the road. Railway officials now advise, as being necessary to safety, that all these cars be overhauled and that steel underframes be substituted for the existing weakened and aged wooden underframes.

The average cost of the inadequate equipment on these cars has been about \$2,380 for each car.

PERSONNEL, EQUIPMENT, AND OPERATION OF EXISTING RESCUE CARS.

The personnel of the rescue cars in operation during the past few years has been, on each car, two miners, one to give training and demonstrations in the use of breathing apparatus and other life-saving equipment, and the other to train miners in first-aid methods, and a cook-janitor to take care of the car and its equipment and to supply the meals for the miners and himself.

The equipment of each rescue car has comprised 8 to 12 sets of artificial breathing apparatus, together with the supplies used in the mine-rescue training and demonstrations and the first-aid training and demonstrations, extra supplies of oxygen and other materials used in the demonstration work and in actual mine-rescue work at mine disasters, a limited quantity of fire-fighting apparatus, and sets of ordinary tools to be used in case of repairs on the car or in repairs rendered necessary in portions of the mine.

The operations of each rescue car may be considered as divided between the work in connection with mine disasters and ordinary preventive educational work.

PREVENTIVE EDUCATIONAL WORK OF EXISTING RESCUE CARS.

Under normal conditions each car is expected to be traveling from one mine or group of mines to another in a given coal field. The car stops at a given mine or group of mines for a week or ten days. During this time the two miners give a number of general demonstrations of mine rescue and first-aid methods; and in addition to this they train from five to ten men at each mine or group of mines in rescue methods and usually a larger number of men, often two or three times as many, in first-aid operations.

Whenever it has been possible, as has been the case at occasional intervals, that a mining engineer could accompany the car, in addition to the demonstration work mentioned above, the mining engineer has given a number of public addresses to the miners and the managers of mines, illustrated with lantern-slide pictures, with inscriptions under each picture in different languages, showing in contrast the more dangerous and the safer methods of mining. In the work as it is proposed to enlarge it there will be a mining engineer with the car all the time; and in addition to the lectures and demonstrations he will make examinations into the mining conditions, and advise the mine officials on the ground as to possible improvements. The mine surgeon will do the same as to mine sanitation and other health conditions.

WORK OF EXISTING CARS AT MINE DISASTERS.

While the rescue work of the cars is unquestionably important, the committee believes that the preventive educational work carried on by these cars is of still greater importance as a means of helping to prevent mine disasters. The aim of the educational work is to supply miners, mine foremen, fire bosses, and other mine employees with information concerning the latest safety methods and appliances, and to interest them and to secure their cooperation in the general movement for mine safety and better mining conditions.

When a mine disaster occurs in any coal field the rescue car nearest the mine disaster is carried to the scene of the disaster as quickly as possible by the first passing train or by a special locomotive. When it arrives, the two miners with the car, subject to the authority of the State officials, enter at once upon the rescue work at the mine, and they call into service to cooperate with them such additional miners in the vicinity as they may have already trained in rescue methods. In case of a large mine explosion, the two nearest mine rescue cars may be ordered to the scene of the disaster. Generally they are met there by two or more of the mining engineers of the bureau experienced in rescue work and whose business it is to examine into the nature and extent of the mine disaster, as soon as possible after the disaster occurs.

CONTRAST BETWEEN THE OLD AND PRESENT MINE RESCUE METHODS.

Under the system now being practiced in this and other countries, the pioneer work in entering the mine, while still perhaps full of wreckage and poisonous gases, is being done by men of a specially organized force wearing as may be necessary, artificial breathing

apparatus, and carrying with them as precautionary measures safety lamps and small animals (usually birds), which are used for detecting the poisonous carbon monoxide, known as "white damp" by the miners. As rapidly as the ventilation of the mine can be restored, these trained men with artificial breathing apparatus are followed by experienced miners who, while taking every precaution, do not need to wear artificial breathing apparatus.

In connection with the organized system of rescue work along these lines during the past few years, some 80 men have been rescued from the mines by the trained men of the bureau, and some 500 miners have been rescued by other parties, many of these other parties having been trained in rescue methods by the men connected with the bureau.

This well-organized rescue work is in marked contrast with the older rescue methods in force a few years ago. This is illustrated by the experience at a Wyoming mine disaster in 1909 at which 40 miners lost their lives in an unorganized effort to rescue 20 miners caught in a mine explosion a few hours before.

THE NEEDED EXPANSION OF THE MINE SAFETY CAR WORK.

Each of the seven rescue cars operated in the coal fields during the past three years has been kept in operation during an average of five to six months each year, the full time that the cars could be operated with the funds available. Furthermore, it has not been possible to keep on each mine-rescue car either a mining engineer or a surgeon, and for this reason not only has the work of the car been restricted in time but also restricted in effectiveness.

The experience during the past few years has shown that several of these cars were at the time of their purchase already too badly worn to permit of their being used for extended journeys, and in the case of several cars the cost of the repairs has already exceeded the original cost, so that even the present work can not be continued without the overhauling and repair of the cars now in the service.

Moreover, as regards several of the cars, although the railway companies have been willing to handle them on slow trains they have not considered it safe to handle these same cars on fast express trains, although, of course, speed is highly desirable in time of serious mine disasters.

Railway officials have therefore recommended that all of the existing rescue cars, except car No. 8 (which was so treated at the time of its original purchase), should have steel underframes substituted for the wooden underframes which these old cars now have, and should be subjected to a thorough overhauling and repairing before being placed in service. They also recommend that in the purchase of new cars in connection with the proposed extension of this work, all of these new cars should have steel underframes. These changes are regarded as being necessary, not only for the safety of the cars themselves and the men traveling with them, but also to prevent the wrecking of the trains to which these cars are attached.

The enlargement of the work should take place along the following lines:

(1) Each of the eight existing mine-rescue cars should be thoroughly repaired, and as a part of such repairs each of the seven cars now having old wooden underframes should be given a steel underframe.

(2) The equipment for each of the existing cars should be thoroughly overhauled and repaired and increased in quantity, so that in addition to the ordinary equipment required for the training and demonstration work there would be certain new equipment kept in the best possible condition for the hazardous work attending mine disasters. Among other items of equipment there should be special facilities for hoisting (a few men at a time), fire fighting, etc., for use when the ordinary equipment of the mine may be destroyed or so badly damaged as to be temporarily out of commission.

(3) There should be added to each car a mining engineer, a mine surgeon, and a stenographic clerk. (The duties of and need for each of these is stated below.)

(4) The total number of cars should be increased from 8 now in hand (7 in the coal fields and 1 in the metal-mining regions) to 15, through the purchase of 7 additional cars. Thirteen of these cars should be operated in the coal fields and two in the metal-mining regions.

(5) Each of these cars should be operated for a period of 11 months. The thirteenth car would be operated as a relief car for the other 12 in the coal fields, replacing 1 of the 12 cars during each succeeding month. Under such a system, in the coal fields, 12 cars with full crews would in this way be actually in full operation for the entire year. The 2 cars assigned to the metal-mine regions should each be operated for 11 months.

(6) There should be a headquarters organization located at some central point, probably at the Pittsburgh laboratories, under the general direction of which all of the cars could be operated. Here the necessary researches could be conducted, looking to the improvement of rescue equipment, together with the repairs of such equipment; and such other work could be done as would contribute to the efficiency of the entire work connected with such central organization. There would be a chief surgeon and a chief mining engineer who, in addition to guiding the work of the several mining engineers and surgeons on all of the mine-rescue cars, would follow up their work by suggestions and cooperation in the organization of local first-aid teams at the different mines, and encouraging the reading of miners' circulars and other publications sent out by the bureau. Engineers connected with this central organization should also visit each mine a few weeks or months subsequent to the visit of the mine-rescue car, with a view to seeing that the new interest in safety measures, occasioned by the work of the rescue car, is kept alive.

DUTIES OF THESE ADDITIONAL MEN, AND WHY NECESSARY.

The mining engineer will have charge of the car operations. He will arrange for and will join in giving the public demonstrations and illustrated addresses to be attended by all of the miners of the particular region where the car may stop. He will make a careful examination of each mine as to its safety conditions and will suggest possible improvements in equipment and methods. He will submit to the Bureau of Mines reports of all operations of the car, and more

especially as to safety conditions and possible improvements at each mine or group of mines. His recommendations will be taken up with the mine owners with a view to securing their adoption. The services of an experienced mining engineer in charge of the work of each of these cars is of evident importance. Indeed, it may be regarded as essential to success.

The mine surgeon or sanitary engineer will make a medical examination of all the miners who may apply for training. This requires skill and experience. No miner should be accepted for rescue training who is not physically sound. The surgeon will himself superintend the training in first aid to the injured. Many physicians have protested against the former practice of the Bureau of Mines of having this training done by miners.

The mine surgeon will also make a careful examination into the health conditions in and about the mines, and will submit recommendations in behalf of such improvements to the mine management. This he will do on a basis of cooperation between the Bureau of Mines and the Public Health Service. He will give general illustrated lectures to the miners and other mine employees on possible improvements in health conditions. He will submit reports to the Bureau of Mines in connection with all operations relating to the examination and training of the miners and the examination of and possible improvements in the health conditions in and about the mines. At mine disasters the surgeon will aid in reviving the rescued miners, a work in which extended experience and skill is needed.

The stenographic clerk will assist the mining engineer and the mine surgeon in recording their examinations and inquiries and in the preparation of their reports to the Bureau of Mines and to the mine management. Inasmuch as the mining engineer, the mine surgeon, and the two miners will generally be absent from the car during the time of making their examinations and doing their training work, the stenographic clerk will at such times be in charge of the car, explaining its operations to visiting miners and mine operators, and will look after the instruments and other equipment kept on board the car. This work of the stenographic clerk would greatly increase the efficiency of all the other men on the car, and would give the bureau such records of the work and of mining conditions as would not be otherwise obtainable.

Of the two miners, the foreman miner will carry out the training in connection with the mine rescue work and the first-aid miner that in the first-aid work, both under the supervision of the mine surgeon. In time of mine disasters both these miners will be expected to take part in organizing and leading the rescue work in the mines.

DO RESULTS ALREADY OBTAINED WARRANT THIS EXPANSION OF THE WORK?

This question may be answered in the affirmative without hesitation if the entire situation is considered. Some evidence of past improvement is shown by the accompanying statistical data, although the improvement is neither decisive nor regular. However, in the examination of these data the following facts should be understood

(1) That the safety investigations of the Government since their inauguration in 1908 have been limited almost entirely to a study

of mine explosions (which cause less than one-fifth of our total coal-mine fatalities); and in these explosion investigations the bureau's experimental coal mine—in which its most important experiments are to be conducted—was not ready for satisfactory work until 1913. Meanwhile the requests for funds with which to study, investigate, and develop preventive measures in connection with other and even more important causes of mine accidents have unfortunately had little response.

(2) Every year our mining operations enlarge, the number of men working in individual mines increases, and our coal mines become deeper and naturally more hazardous from increasing gas, falls of roof, machinery, and other conditions associated with greater depths and pressures. Therefore, unless suitable safety improvements are devised and utilized, the death rate in our mines will increase even faster than our mineral production.

The tabular statement given below will indicate some of the important facts relative to the loss of life in the coal mines of the country during the past 12 years. Taking the average death rates for the six years, 1902–1907, inclusive, prior to the inauguration of the Government's investigations of mine explosions, and comparing these with the averages for the six years, 1908–1913, inclusive, since the inauguration of these investigations, it brings out the following facts:

Average number of men killed in the coal mines of the United States per 1,000 employed:	
1902 to 1907, average for five years.....	3.71
1908 to 1913, average for five years.....	3.73
Number of men killed in the coal mines of the United States per 1,000,000 short tons of coal mined:	
1902 to 1907, average for five years.....	5.88
1908 to 1913, average for five years.....	5.38
Production of coal in the United States, in short tons, per fatal accident:	
1902 to 1907, average for five years..... tons..	172,000
1908 to 1913, average for five years..... do..	188,000

Production, number of men employed, and number of men killed in and about the coal mines in the United States in the calendar years 1902 to 1913, inclusive.¹

Year.	Production (short tons). ²	Number employed. ²	Number killed.			Production per death (short tons).
			Total.	Per 1,000 employed.	Per 1,000,000 short tons mined.	
1902.....	296,687,066	510,437	1,895	3.71	6.39	156,563
1903.....	345,200,166	547,431	1,752	3.20	5.08	197,317
1904.....	339,164,812	573,373	2,004	3.50	5.91	169,244
1905.....	386,379,243	615,628	2,232	3.63	5.78	173,109
1906.....	407,835,003	631,086	2,116	3.35	5.19	192,710
1907.....	461,406,023	655,418	3,197	4.88	6.93	144,325
1908.....	404,932,764	672,794	2,449	3.64	6.05	165,346
1909.....	460,761,427	666,523	2,668	4.00	5.79	172,699
1910.....	501,596,378	725,030	2,840	3.92	5.66	176,618
1911.....	496,221,168	728,348	2,719	3.73	5.48	182,501
1912.....	534,466,580	722,662	2,360	3.27	4.41	226,469
1913.....	³ 570,000,000	³ 728,355	⁴ 2,785	3.82	4.88	204,688

¹ The figures for production and number of men employed are from "Mineral Resources of the United States," U. S. Geol. Survey, except for the number of men employed in 1911, which were compiled by the Bureau of Mines.

² These figures represent the production and the number of men employed in those States in which records of fatal accidents are in existence. The figures are directly comparable with the number of men killed as given in the fifth column and are those on which the mortality rates are based. It will be noted that the portion of the industry not represented in the rates from 1902 to 1909 is small and that since 1909 the entire industry is represented.

³ Estimated. Subject to revision.

⁴ Does not include December fatalities in Kentucky.

Average number killed per 1,000 employed in the coal mines of the principal coal-producing countries for the 10-year period, 1901 to 1910.

	India.	Belgium.	Austria.	Great Britain.	France.	New South Wales.	Germany.	Japan.	United States.
Average, 1901-1910.....	.96	1.02	1.04	1.36	1.69	1.74	2.11	2.92	3.74

Average number killed per 1,000,000 short tons of coal mined in the principal coal-producing countries for the 10-year period, 1901 to 1910.

	New South Wales.	Great Britain.	Austria.	Belgium.	United States.	Germany.	France.	India.	Japan.
Average, 1901-1910.....	3.70	4.40	5.05	5.56	5.83	7.55	7.79	9.00	22.71

Safety work by the Bureau of Mines in metal mining in the United States has been limited to the past two years (1912 and 1913). The year 1911 is the latest for which metal mine accident data is available for other countries. The data for this one year will serve to indicate the relatively high death rate in the metal mines of the United States and other countries.

Country.	1911		Country.	1911	
	Number employed.	Number killed per 1,000 employed.		Number employed.	Number killed per 1,000 employed.
Australasia:			Great Britain.....	29,025	1.48
New South Wales.....	19,360	1.81	Greece.....	6,764	2.07
New Zealand.....	7,400	0.68	Italy.....	49,498	2.36
Queensland.....	11,091	0.90	Japan.....	80,896	1.76
Tasmania.....	5,247	0.76	Portugal.....	7,484	1.34
Victoria.....	14,051	1.35	Spain.....	120,781	1.49
Western Australia.....	15,428	2.33	Transvaal.....	225,538	4.14
Austria.....	20,299	0.49	United States.....	165,979	4.19
France.....	29,988	2.83			

(3) Among the more specific safety improvements that are being developed and are now being introduced in coal mining under the lead of the Bureau of Mines are: (a) A new type of quick-flame, low-temperature explosive much safer than black powder for use in gaseous and dusty mines. There are now 116 different explosives of this new type manufactured by 18 different companies, and there is already in use (1913) more than 25,000,000 pounds of these explosives annually; (b) new types of miners' electric safety lamps and safety electric motors for use in gaseous mines. These and other improvements now underway in connection with safety measures, rescue and first-aid methods, and the general educational work inaugurated in connection with the mine rescue cars and stations during the past three years have won the cooperation of the miners and the mine operators, and the conditions are now favorable to the far larger cooperation of the miners and operators with the Bureau of Mines in its proposed larger work.

Many large mine operators have already put in force safety precautions to such an extent that the death rate in their own mines has been largely reduced, and in this work they have the cooperation of the miners and mine inspectors.

It should be remembered, also, in this connection that the mine rescue car work has as yet reached only a small percentage of even the coal miners of the United States. But there is much evidence going to show that the miners and other mine employees who have attended the illustrated lectures and demonstrations given in connection with the work of the rescue cars have exhibited a much greater interest in the mine safety work of the bureau, have called for its publications in increasing numbers, and in other ways have shown a willingness to cooperate with the bureau and with the inspectors and mine operators in putting safety appliances and methods into practice.

The condition which, more than any other, is retarding progress in this great safety movement is the failure of the National Government to make adequate provision for the more rapid extension of its research and educational work. Miners and mine operators agree in commending the thoroughness and effectiveness of the work of the Bureau of Mines as far as it has been able to go, and in expressing their willingness to accept and act upon its advice and recommendations, but they complain of the long delays and of serious limitations in this work; and the lack of conclusions and of specific recommendations as regards many possible improvements in safety and health conditions is seriously holding back such improvements in all parts of the country.

PROGRESS OF THE WORK UNDER THE PRESENT AS COMPARED WITH THE PROPOSED LARGER OPERATIONS.

A careful estimate shows that at the rate of progress under existing conditions between 12 and 15 years would be required for a single visit of one of the existing rescue cars to each important coal mine or group of mines in the United States. If the enlargement of the work now proposed is carried out in full, a rescue car with its demonstrational and other educational work would visit each important mine or group of mines in the United States once in four years' time, and during this time the training work of these cars would be so extended that from 10 to 30 miners would be trained in rescue and first-aid operations at each important mine or group of mines in the country.

WHY THIS EDUCATIONAL WORK CAN NOT BE CARRIED ON BY PUBLICATIONS ALONE.

A large proportion of the men entering the mines in the United States each year come from the farms and villages of different European countries; they are unfamiliar with our language, our institutions, and our laws, and know little or nothing of mining.

A majority of the men now working in the coal mines of the United States to-day speak and read but little English. It is therefore difficult to reach these men through publications, even when the latter are prepared in the most simple and elementary manner.

The plan followed most successfully by the employees of the Bureau of Mines in reaching and interesting these men is through

giving actual working demonstrations in mine rescue, first aid, and other safety measures and methods, and the giving of lectures illustrated with lantern slide pictures which contrast the safe and the dangerous methods. Each of these pictures used has a short, one line description under it in four or more different languages most common among the miners. In these lectures and demonstrations, local interpreters are used at intervals as the need for them may appear.

THIS DEMONSTRATION WORK AWAKENS NEW INTEREST AMONG MINERS, AND IS GOOD WELFARE WORK.

Work of this kind develops a new interest in the safety work among the miners, and following the movements of each of the existing rescue cars this interest on the part of the miners is shown in their call for the publications which treat of the mine-safety work.

So far as it has gone, this educational work is assuredly developing safer and better mining, and the leaders among the miners express the belief that if carried forward on a larger scale and in a more thorough manner, the work can not fail to develop also better citizenship among these miners.

Certainly many miners in different parts of the country have expressed a growing interest in and friendly feelings toward the National Government, as they come to see the evidences that the National Government is interested in their welfare. On the other hand, the great majority of the miners have not yet seen evidences of any public interest in their welfare, and no one need feel surprised at their lack of interest in government. Their chief idea of government—brought with them to this country—is that of suppression or oppression. In the enlargement of the mine-safety work now proposed the National Government certainly has its best opportunity to show to more than 2,000,000 of its citizens that it does have a real and an active humanitarian interest in promoting their welfare; and it can thereby gain their good will.

All this demonstrational and other educational work is of a pioneer character. If the mining conditions of the country can be improved and mining made safer and more attractive, men will stay with the mining industry in this country as they have been doing in other countries, and there would be less need of training a new army of miners each year. It will, therefore, be real economy to push the work more rapidly now.

There is every reason to believe that such educational work carried forward by the National Government under such methods as to win the confidence and cooperation of the miner will make for real progress in this industry in the same way that the national appropriations for educational work in agriculture have led to improvements and real progress in that industry, which are building up a greater public welfare.

COST OF THE PROPOSED ENLARGEMENT OF THE SAFETY-CAR WORK.

The cost of overhauling the eight existing mine-rescue cars, of providing seven additional mine-rescue cars with their full equipment, and of operating all of these cars throughout the entire year on the basis described above is shown in the tabular statement given below.

Of the eight existing cars, seven will need to be provided with steel underframes to be substituted in each car for the worn-out wooden underframes which they now have, for reasons previously stated. This substitution of the steel underframes, together with the other needed repairs, will make the overhauling of seven of the existing cars cost about \$3,000 per car. One of the eight cars already has a steel underframe, and its overhauling will be inexpensive. The estimates obtained covering the purchase of these additional cars indicates an average cost of about \$5,500 per car.

Nearly all of the existing cars when originally constructed as new cars were valued at from \$20,000 to \$30,000 per car. They were purchased by the Bureau of Mines at from \$1,500 to \$2,500 each after they had been abandoned for ordinary usage by the Pullman Co.

The cost of repairing cars already in use, of purchasing new cars, and of equipping and operating the cars in accordance with the plan set forth, are given in the following statement:

Cost of the cars:

Repairs of 7 of the 8 existing cars, at \$3,000 (providing each with safer steel underframes).....	\$21, 000	
Purchase of 7 additional cars, at \$5,500.....	38, 500	
		\$59, 500

Cost of equipment:

New additional equipment for 8 existing cars (estimated for in sundry civil bill, \$30,000; if not incorporated in sundry civil bill, should be incorporated in this estimate), equipment for 7 new cars, at \$4,500..	31, 500	
Total cost of cars and equipment.....		91, 000

Cost of operating 1 car:

Services—

1 mining engineer.....	\$3, 000	
1 first-aid surgeon.....	2, 700	
1 foreman miner.....	1, 800	
1 first-aid miner.....	1, 680	
1 stenographic clerk.....	1, 000	
1 cook and janitor.....	720	
		10, 900

Maintenance—

Travel of men when absent from car.....	1, 200	
Subsistence of 6 men, at \$1 per day on the car, 335 days....	2, 010	
Repairs to the car and equipment.....	1, 200	
Supplies used in training.....	4, 440	
Special extra material and labor at mine disasters.....	600	
		9, 450

20, 350

Cost of operating in the field 15 cars, at \$20,350 each..... 305, 250

Cost of headquarters, organization, and work necessary to successful operation in the field of the 15 mine-rescue or mine-safety cars:¹

1 mining engineer in charge.....	\$4, 500	
1 mining engineer in charge of rescue organization work following the car operations.....	4, 000	
1 chief surgeon.....	4, 000	
1 engineer in charge of rescue equipment and methods.....	3, 000	
1 engineer in charge of publications for supplementing rescue and first-aid demonstrations.....	3, 000	
2 special assistants, at \$2,400.....	4, 800	
2 mechanics for rescue equipment, at \$1,800.....	3, 600	
2 assistant mechanics for rescue equipment, at \$1,500.....	3, 000	
2 safety commissioners for special organization work among the miners, at \$3,300.....	6, 600	

¹ See par. 6, p. 16.

Cost of headquarters, organization, etc.—Continued.

Special expert services for improvements in rescue equipment and methods.....	\$6,000
3 stenographers and typewriters, at \$1,500.....	4,500
2 stenographers and typewriters, at \$1,200.....	2,400
Travel expenses and subsistence.....	10,000
Shop equipment and supplies for rescue equipment, repairs, and improvements.....	10,310
	\$69,750
Total yearly cost of the mine-safety work.....	375,000
Amount now expended for operation on the existing incomplete and inefficient basis of 8 existing rescue cars during current year (9 months) under the appropriations for mine-accident investigations.....	70,150

As will be seen from the above tabular statement the total investment in additional cars and equipment and in the necessary repairs of existing cars and the equipment proposed for these larger operations aggregates \$91,000. This is not to be considered an additional appropriation, for the reason that these expenses might be covered in the following manner: It is likely that between two and three months would elapse following the passage of the appropriation act before all the additional cars and equipment and personnel of the various cars could be secured, and therefore that disbursements for operation might be conveniently delayed until three months following the passage of the appropriation act. By this date a three-months' portion of the proposed appropriation of \$375,000 for the mine rescue work will be saved sufficient to cover the amount of the necessary investment in cars and equipment, and after that date the entire machinery of the enlarged operations would be operated continuously during the remaining nine months.

THE URGENT NEED OF ADDITIONAL MINE-SAFETY INVESTIGATIONS.

The amount to be expended for the operation of the eight existing rescue cars operated on their smaller scale, during seven to eight months of the current year, is estimated to be \$70,150. This amount may, therefore, be deducted from the existing appropriation of \$347,000 for mine accidents, but in the opinion of the committee it should be allowed to remain as a part of that appropriation to be expended on long-delayed urgent investigations in relation to other mine safety improvements, which for lack of funds the bureau has not yet been able to take up. These investigations are as follows:

(1) *Necessary extension of experimental mine work.*—Recent mine explosions render necessary during the fiscal year 1915 an increase in the allotment for the explosion tests in the experimental mine of \$15,000 more than the allotment for this work during the current year. The results of the current year's experiments are highly encouraging as to the possible use of stone dust and dry clay as preventive of coal-dust explosions; but they also indicate the need of extending the dimensions of the mine to a considerable extent.

(2) *Accidents from falls of roof.*—One of these is the falls of roof in mining, which causes from one-third to one-half the total loss of life charged against the mining operations in this country. This is an investigation requiring thoroughly trained technical knowledge. The loss of life from this cause during the last five years in coal mines alone has been more than 6,000 and the seriously injured 18,000 to 20,000.

The situation is not to be remedied by the claim that this class of accidents is due to carelessness. There is often a reasonable ignorance on the part of both the miners and the mine foreman concerning the nature of the roof rock and its behavior under different conditions of moisture and pressure. A thorough investigation of the problems, using both the practical experience of the miner and the technical knowledge of the engineer, can not fail to be helpful.

It has been urged that in this country we should follow the practice of Great Britain, in which country the proportionate loss of life from this cause during the past five years was less than one-half that in the United States. But the adoption of the British timbering practice in all our American coal mines would add \$50,000,000 to \$75,000,000 yearly to the cost of coal in this country, to be paid by the consumers of coal in all the States.

It is estimated that an investigation during the next few years costing about \$40,000 per annum, would probably find other and far cheaper methods of accomplishing the same result.

(3) *Accidents from mine equipment.*—The loss of life from mining, haulage, and hoisting machinery, failure of signals, etc., in the coal mines of the United States during the past five years was 2,100 men; and more than 6,000 men were seriously injured. There is serious need of investigation in this subject, which as yet the bureau has not been able to undertake. It is estimated that such an investigation would cost \$35,000 per annum.

(4) *Accidents (other than explosions) from electricity.*—From this cause there have been many deaths and many serious nonfatal accidents in the mines of the country during the past five years. An investigation of this subject has thus far been beyond the means of the bureau, but it should be taken up without further delay. Such an investigation continued during the next few years is estimated to cost about \$20,000 per annum.

(5) *Accidents (other than explosions) from explosives in mines.*—During the past five years about 700 men have been killed and fully 2,000 have been seriously injured from this cause in our coal mines alone. In addition to accidents of this type, a large number of miners have suffered from the poisonous effects of the fumes or gases given off in metal mines and tunnels, where the ventilation is poor. Investigation into this subject to cost \$20,000 during the fiscal year 1915 have been estimated for in the sundry civil bill.

(6) *Improvements of health conditions in the metal-mining, metallurgical, and other mineral industries.*—A comprehensive investigation of conditions affecting the health of workers is one of the urgent existing needs of the mining industry. Such investigation would affect the health condition of one and a half million men employed in these several phases of the industry, and no one familiar with conditions will for a moment question its importance. In conducting it, the Bureau of Mines would have the active cooperation of the Public Health Service, which would study the different ways in which mine conditions affect the health of employees, while the Bureau of Mines would seek to ascertain the existence and the causes of bad health conditions and the methods of improving the same. A careful estimate indicates that the cost of the part of this work to be carried on by the Bureau of Mines would be \$50,000 a year for the next few years.

The investigations to which attention has been called in the above statements, although possibly the most urgent, are by no means the only ones that should be made by the Government in any systematic and comprehensive attempt to increase safety, improve health conditions, and bring about a more efficient development in the various mineral industries.

SLOW PROGRESS IN THE PAST GOVERNMENT MINE-SAFETY INVESTIGATIONS.

During the past two years, and especially during the past year, many complaints have come from both miners and mine operators of the slowness with which mine safety results were being obtained through the Bureau of Mines. Both operators and mine owners have shown a desire to inaugurate new improvements looking to greater safety and along any lines in which they could receive definite and satisfactory recommendations or advice; and within the bureau itself every effort has been made to press these inquiries and investigations more rapidly with a view to obtaining these results with less delay, but progress has been unfortunately slow.

In connection with the investigation of mine explosions, owing to the limited funds at the disposal of the bureau it has required three years to open up the experimental mine near Pittsburgh and get the same in proper shape for experimental researches. With more adequate facilities this could have been done within a single year. As another example, three years have been required for certain researches looking toward the development of miners' electric safety head lamps, all of which, with larger facilities, might have been done within a single year. We have found it difficult to give to the miners especially a satisfactory explanation of these delays.

THE ECONOMICS OF MINE ACCIDENTS AND HEALTH CONDITIONS.

No one likes to estimate the money value of a human life, but at times it becomes necessary to do this, especially in working out the economics of compensation acts. It is a reasonable estimate that during the past 10 years more than 30,000 men have been killed and more than 100,000 seriously injured in connection with the accidents in the mining industries of this country. It is impossible to estimate the number who have suffered from bad health conditions in many metal mining, tunneling, quarrying, metallurgical, and other mineral industry plants. It is impossible to estimate the number of men with health shattered through these conditions who have had to give up their work years before their natural time or the number of dependents who have suffered thereby.

If it be assumed that each human life is valued at \$3,000, it will be seen that the deaths alone in the mines have cost in the 10 years \$90,000,000.

If each of the 100,000 seriously injured lost 20 days at \$3 per day, a reasonable assumption, this represents \$6,000,000 lost from this cause.

As to the metal mines, metallurgical plants, and quarrying operations, unfortunately there are few reliable data regarding health conditions in the United States; yet there are sufficient isolated figures

concerning certain districts to indicate that the death rate from occupational diseases is even greater than the accident rate.

Whatever may be the value put upon a human life in arranging for a reasonable compensation, these losses of life and labor are national in their extent and character and fall ultimately upon the general public as representing the consumers of mineral products. Whatever the theoretical bases of value of these losses, the true cost falls directly upon the injured and upon the consumer. Also, whatever additional expenditures may become necessary on the part of the operators of mines, metallurgical, and other mineral industry plants to reduce this loss of life and labor must ultimately be a charge upon the general public as representing the consumers of mineral products.

It is important, therefore, not only from the humanitarian standpoint, but also from the standpoint of economics, that everything possible should be done to reduce the loss of life and labor in the mining industry both through prevention of accidents and through the improvement of health conditions. It is also a matter of decided importance to the general public from both the standpoints that these improvements should be brought about at a minimum cost and in a minimum time. Real economy involves speedy accomplishment as well as efficiency in the improvements to be made.

It is important, therefore, from both the humanitarian and economic standpoints that the investigations by the National Government, with a view to better safeguarding the lives of the men connected with the more hazardous branches of the mining industry, should be conducted as thoroughly and as rapidly as the work can be done effectively, in order that the improvements may be inaugurated without delay and to the fullest possible extent.

It is equally important that after the inquiries and investigations have been conducted and reasonable conclusions formed the information should be disseminated promptly and effectively among the miners and those who manage the mines.

The committee unanimously recommends the passage of the bill.



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